~~selecting simultaneously a plurality~~ of lines of row electrodes in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes; and

applying predetermined voltages to the selected lines of the row electrodes during a selection period, wherein

the selection period of a display frame is divided so as to enable time ratio of a first display frame to a second display frame to be different in two continuously displayed frames, and column electrodes are driven with a voltage pattern so as to reduce a change of voltage level in each of the divided periods.

A4 cmcl

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-21 are presently pending, Claims 1, 8, 16, 17 having been amended, and new Claim 21 added.

As a preliminary matter, Applicants acknowledge with appreciation the courtesy of an interview extended by Examiners Steve Saras and Srilakshmi Kumar on October 23, 2002. At the interview, differences between the claimed invention and the prior art were discussed. The discussion, during the interview, concerned some of the features of the present invention which are not disclosed or suggested in U.S. Patent No. 5,852,429 to Scheffer. Examiners Saras and Kumar acknowledged that Scheffer fails to teach or suggest the claimed invention and that the Office Action was incorrectly applied to the claimed features. Applicants were requested to indicate

support in the specification for the claimed features of independent claims 1, 8, 16, and 17. Examiners Saras and Kumar also indicated that rejections based on Scheffer would be withdrawn and a new search and consideration would be provided upon receiving a formal response from the Applicants.

In the outstanding Office Action, Claims 1-20 were rejected under 35 U.S.C. 102(e) as being anticipated by Scheffer.

Applicants respectfully traverse the rejection of Claims 1-20 under 35 U.S.C. §102(e) for the following reasons.

Amended Claim 1 discloses a driving method for a liquid crystal display. The method includes selecting simultaneously a plurality of lines of row electrode in a liquid crystal display device having a plurality of row electrodes and a plurality of column electrodes; and applying predetermined voltages to the selected lines of the row electrode during a selection period, wherein the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern so as to reduce a change of voltage level in each of the divided periods.

On the other hand, Scheffer discloses an addressing method and apparatus for addressing LCD panels by continuously driving row electrodes of the matrix with row signals, each having a train of pulses. The row signals are periodic in time and have a common period T which corresponds to the frame period. During each frame period, multiple column signals are generated from the collective information state of the pixels in the columns. The column voltage at any time during frame period T is proportional to the sum obtained by considering each pixel in the column and adding

the voltage of that pixel's row at time "t" to the sum if the pixel is to be "off" and subtracting the voltage of the row of that pixel at time "t" from the sum if the pixel is to be "on."

From the above, one would note that Scheffer discloses an addressing method for LCD panels by continuously driving row electrodes of a matrix with row signals. As acknowledged by the Office Action, Scheffer fails to teach or suggest all the features recited in the claimed invention. In view of the above, Applicants respectfully request that the rejection of Claims 1-20 under 35 U.S.C. §102(e) be withdrawn.

⇒ Independent Claim 1 finds support at least at page 44, lines 8 through line 22, and Figure 22 of the present specification. These portions of the specification disclose that frame memories 12 hold written gradation data, of image data, for conducting multiple simultaneous selection driving method (MLA driving). The MLA operating circuit 13 reads gradation data 103 from the frame memories 12 to produce voltage patterns to be applied to column electrodes by conducting a multiple line simultaneously selecting operation. The voltage patterns are then outputted to a column data converter 14. The column data converter 14 converts the voltage patterns produced in the MLA operating circuit 13 into voltage patterns which hinders an uneven display, and the converted voltage patterns are outputted to the column drivers.

Page 45, line 1 through page 46, line 12 disclose *inter-alia* a timing control circuit 151 produces control signals which are supplied to the column drives and the row drivers. The liquid crystal display device includes a row selection pattern

generator for supplying row selection pattern signals, based on an orthogonal matrix, to the row drivers.

As noted above, the gradation processing circuit 11 modifies the received image data to be gradation data 102 corresponding to gradation levels for each display frame and writes the modified gradation data in the frame memories 12.[1] The frame memories hold the gradation data until they are read several times for multiple line simultaneously selecting driving.

Figure 10 shows conversion of a 3-bit gradation data into a 4-bit data showing ON and OFF displays in each of the periods T1-T4 in the 4-divided selection periods. Then, imaginary data are produced on the display data of simultaneously selected 3 lines so that the number of voltage levels applied to the column electrodes in each of the divided periods T1-T4 is made 2 levels. Because of the gradation data of 3 display lines, there occur 3 change points of voltage level in the second selection period, thus increasing uneven display due to a deformation of the waveform at the change point of voltage level. [2] The column data converter 14 of the present invention converts the voltage pattern signals produced in the MLA operating circuit 13 into a voltage pattern which hinders an increase of an uneven display. [3]

The column data converter modifies voltage patterns as shown in Figure 25 and described in more detail at page 47, lines 14 through page 48, line 5. The timing control circuit 151 outputs latch signals by which data is taken into the column drivers for driving the liquid crystal display. Row selection pattern signals generated from

[1] See page 45, lines 18-22 of the present specification.
[2] See Figure 11C.

row selection pattern generator are outputted to row drivers which apply predetermined voltages to the row electrodes of the liquid crystal panel. [4]

Regarding independent Claim 8, in addition to the support provided by above recited portions of the specification, additional support may be found at least at Figures 27-29, and page 54, line 16 through page 55, line 7. Specifically, Figure 29 shows a display having a highest intermediate gradation level (ON) having a value 9 and a display having the lowest intermediate gradation level (OFF) having a value "0". The voltage level values of intermediate gradation show substantially uniformly arranged 8 gradation levels except for the voltage level value adjacent to the highest intermediate gradation (ON) and the voltage value adjacent to the lowest intermediate gradation (OFF). See page 54, line 26 through page 55, line 7.

Regarding independent Claim 16, in addition to the support provided by above recited portions of the specification, additional support may be found at least at page 56, line 7 through 16. Also see Figures 30, 31 of the present specification.

Regarding independent Claim 17, in addition to the support provided by above recited portions of the specification described with respect to Claims 1, 8, and 16, additional support may be found at least at page 54, lines 4-13 of the present specification.

From the above, it is believed that the Applicants have identified support in the present specification for Claims 1, 8, 16, and 17 as requested by the Examiners during the October 23, 2002 interview.

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[3] See page 47, lines 9-14 of the present specification.
[4] See page 48, line 20 through page 49, line 27 of the present specification. Also see page 51, lines 6-20 of the present specification.

New Claim 21 finds support at least at page 42, lines 3-10 of the present specification.

Should the Examiner have any further comments or suggestions, it is requested that the Examiner contact the undersigned at 703-413-3000.

Respectfully submitted,

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Please amend Claims 1, 8, 16, and 17 as follows:

1. (Amended) In a driving method for a liquid crystal display device, the method comprising:

selecting simultaneously a plurality of lines of row electrode in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes; and

applying predetermined voltages to the selected lines of the row electrode during a selection period, [the driving method being characterized in that:] wherein

the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern so as to reduce a change of voltage level in each of the divided selection periods.

8. (Amended) In a driving method for a display device having display elements in a matrix form and producing voltage levels for effecting gradation display, the method [for a display device being characterized in that]comprising:

[in a plurality of continuous display frames,] setting a time of at least one frame period [is made]to be different from that of another frame period, in a plurality of continuous display frames;[,]

dividing the selection period of at least one frame in the plurality of display frames [is divided]into divided selection periods[,]; and

providing on-data and off-data [are provided]in the selection period of the non-divided frame period and the divided selection periods to produce a plurality of voltage levels[, and]; wherein

the plurality of voltage levels are used for a display except for the voltage levels in the vicinity of [the]highest [level]and [the]lowest voltage levels.

16. (Amended) In a driving device for a liquid crystal display device for selecting simultaneously a plurality of lines of row electrode in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes, and applying predetermined voltages to the selected row electrodes during a selection period, the driving device [being characterized by]comprising a driving means for driving column electrodes according to a predetermined voltage pattern in each period formed by dividing a selection period of a display frame so that the divided selection periods have a different time ratio.

17. (Amended) In a driving device for a liquid crystal display device for selecting simultaneously a plurality of lines of row electrode in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes and applying predetermined voltages to the selected row electrodes during a selection period, the driving device [being characterized by comprising]including a driving means, the driving device further comprises:

a timing control means which forms a combination of at least one of two continuous display frames in which time ratio of a display frame period to the other is

within 50 – 90%, and supplies a timing signal to column drivers for driving column electrodes,[a timing signal] so that a selection period of at least one of the two continuous display frames is divided into two portions to produce an n (n: an integer of at least 3) number of divided periods,

a gradation processing means for producing n-bit gradation data based on inputted image data to write the n-bit gradation data in frame memories, and

a column data producing means for producing column data by reading sequentially the n-bit gradation data which are stored in the frame memories in the respective divided periods and supplying the produced data to the column drivers.

21. (New)